

**Dietary and Lifestyle Patterns and Risk of Subtypes of Esophageal and Gastric Cancer: Factor Analysis.** S. A. Navarro-Silvera,\* S. T. Mayne,\* H. Risch,\* M. D. Gammon,<sup>†</sup> T. Vaughan,\*\* W.-H. Chow,<sup>‡</sup> J. A. Dubin,\* R. Dubrow,\* J. Schoenberg,<sup>††</sup> J. L. Stanford,\*\* A. B. West,<sup>‡‡</sup> H. Rotterdam,<sup>#</sup> W. Blot,<sup>§</sup> and J. F. Fraumeni, Jr.<sup>‡</sup> \*Yale University School of Medicine, Department of Epidemiology and Public Health, New Haven, CT; <sup>†</sup>University of North Carolina School of Public Health, Department of Epidemiology, Chapel Hill, NC; \*Fred Hutchinson Cancer Research Center, Program in Epidemiology, and University of Washington, School of Public Health and Community Medicine, Department of Epidemiology, Seattle, WA; <sup>‡</sup>National Cancer Institute, Division of Cancer Epidemiology and Genetics, Bethesda, MD; <sup>††</sup>New Jersey Department of Health and Senior Services, Cancer Epidemiology Services, Trenton, NJ; <sup>‡‡</sup>New York University Medical Center, Department of Anatomic Pathology, New York, NY; <sup>#</sup>Columbia University, Department of Department of Pathology, New York, NY; and <sup>§</sup>International Epidemiology Institute, Rockville, MD.

Incidence rates for adenocarcinomas of the esophagus and gastric cardia have been increasing rapidly while rates for noncardia gastric adenocarcinoma and esophageal squamous cell carcinoma have declined in the United States. We reported previously that nutrients found in plant-based foods were inversely associated with risk of esophageal adenocarcinoma whereas nutrients found in foods of animal origin were positively associated with risk. Dietary behaviors, however, may cluster together and with other lifestyle behaviors such as smoking, making interpretation difficult. In this study we examined clustering of diet and lifestyle behaviors in relation to risk of subtypes of esophageal and gastric cancers in a multicenter, population-based case-control study in the United States in order to understand better the role of diet versus other correlated behaviors in disease etiology. Cases ( $n = 1095$  total) and controls ( $n = 687$ ) were interviewed in person and dietary food frequency and other risk factor data obtained. Data were analyzed by principal components analyses. Certain dietary and lifestyle behaviors clustered together, revealing a fruit-vegetable pattern, a meat-nitrite pattern, a reflux-BMI pattern, and a smoking-alcohol pattern. The fruit-vegetable pattern was inversely associated with risk of both subtypes of esophageal cancer [odds ratio (OR) esophageal adenocarcinoma 0.76 (95% CI; 0.62–0.92); OR squamous cell carcinoma 0.63 (95% CI; 0.49–0.81)] whereas the meat-nitrite pattern was positively associated with risk of all subtypes of gastric and esophageal cancer but most strongly with esophageal adenocarcinoma (OR 3.12, 2.21–4.41). The smoking-alcohol pattern did not cluster strongly with any dietary behaviors but was significantly associated with risk of esophageal squamous cell carcinoma (OR 2.15, 95% CI; 1.71–2.71) as expected. In contrast, the reflux-BMI pattern clustered with a variety of diet and lifestyle variables and was associated positively with risk of esophageal adenocarcinoma and inversely with risk of esophageal squamous cell carcinoma. Cluster analyses, in combination with conventional risk factor analyses, may better inform preventive strategies.

**Effects of Different Vegetable and Fruit Intake Levels on Immunocompetence and Antioxidant Status in Healthy Male Nonsmokers.** B. Watzl,\* J. Möseneder,\* S. Kulling,\* S. W. Barth,\* S. Askevold,\* K. Briviba,\* G. Rechkemmer,<sup>†</sup> and A. Bub.\* \*Federal Research Centre for Nutrition and Food, Institute of Nutritional Physiology, Germany, and <sup>†</sup>Department

of Food and Nutrition, Technical University, Munich, Germany.

Epidemiological studies suggest that diets high in vegetables and fruits (V+F) reduce cancer risk. Whether V+F affect cancer risk by modulating immunocompetence is presently not known. Therefore, in a human intervention trial the effect of low, medium, and high intake levels of V+F on immunological and antioxidative markers was measured. Healthy male nonsmokers (aged  $31 \pm 9$  y) were recruited for the study. For 4 wk all subjects ( $n = 63$ ) were restricted to a V+F intake of 2 servings/d. In the following 4 wk, subjects were randomly assigned to 3 groups ( $n = 21$ ) with 2, 5, and 8 servings of V+F/d, respectively. V+F intake was recorded daily by each study subject. Fasting blood was collected at the start of the study as well as every other week. Study compliance was controlled by measuring plasma carotenoids and ascorbic acid/dehydroascorbic acid concentrations. As immunological markers the percentages of natural killer cells expressing CD56dim/bright and NKp46, lytic activity of natural killer cells, cytokine production (IL-2, IL-12, IL-13, IFN- $\gamma$ , TNF- $\alpha$ ), plasma high-sensitive C-reactive protein (CRP), and lymphocyte proliferation were quantified. Antioxidant status was assessed by measuring trolox equivalent antioxidant capacity (TEAC) and paraoxonase activity as well as activation of nuclear transcription factor NFkB. Plasma carotenoid concentrations at the end of the intervention period significantly differed between groups with low, medium, and high intake levels ( $P < 0.0001$  low vs. high). Plasma ascorbic acid concentrations were high throughout the study period but did not differ between groups. Immunological markers as well as antioxidant status were largely unaffected by the V+F intervention. Only plasma concentrations of CRP were significantly different, with lower CRP concentrations in the group with high V+F intake ( $P = 0.008$ ). In conclusion, in well-nourished male nonsmokers a period of 8 wk with low V+F intake does not result in differences of immunological and antioxidant status compared with subjects consuming 5 or 8 servings/d. [Supported by the World Cancer Research Fund.]

### Food frequency questionnaires

**Validation of the Block98 Food Frequency Questionnaire in a Sample of Canadian Women.** Beatrice Boucher,\* Michelle Cotterchio,\*<sup>†</sup> Victoria Nadalin,\* Nancy Kreiger,\*<sup>††</sup> Torin Block,<sup>‡</sup> and Gladys Block.<sup>††</sup> \*Division of Preventive Oncology, Cancer Care Ontario, Toronto, ON, Canada; <sup>†</sup>Department of Public Health Sciences, University of Toronto, Toronto, ON, Canada; \*\*Department of Nutritional Sciences, University of Toronto, Toronto, ON, Canada; <sup>‡</sup>Block Dietary Data Systems, Berkeley, CA; and <sup>††</sup>Department of Public Health, University of California, Berkeley, CA.

**INTRODUCTION:** The Block food frequency questionnaire (FFQ) is one of the most widely used FFQs in epidemiologic research. Since its development at the National Cancer Institute, it has been revised to reflect changes in consumption and FFQ design. This study is the first to report on the validation of the most recent adaptation of Block's full-diet FFQ (Block98) and is the first time the Block FFQ has been validated in Canada. FFQ reliability (between FFQ1 and FFQ2) and validity (between FFQ1 and average of two 24-h recalls) were assessed by correlating intake estimates for 30 nutrients. **METHODS:** A random population-based sample ( $n = 166$ ) of Ontario women aged 25–74 y was recruited using